

Course Title: Electronic Circuits (2)  
Date: 28/05/2016Course Code: EEC 2206  
Allowed time: 3 HoursYear: second year  
No. of Pages: (4)**Remarks:** (answer the following questions... assume any missing data... arrange your answer booklet)

Use graphs and examples whenever you have a chance during your answer

**Question No. 1 : (18) Marks**

- A. Determine  $Z_i$ ,  $Z_o$ ,  $A_v$  and  $V_o$  for the network of **Fig.1** if  $V_i = 0.1$  mV. **(6 Marks)**
- B. Calculate the input impedance, the output impedance, the output voltage and the bandwidth for the circuit shown in **Fig.2**. ( $C_{be1} = C_{be2} = 25\text{pF}$ ,  $C_{bc1} = C_{bc2} = 10\text{pF}$ ) **(8 Marks)**
- C. Compare between Field Effect Transistor and Bi-polar Junction Transistor? **(4 marks)**

**Question No. 2 : (18) Marks**

- A. For the network of **Fig. 3**: **(8 marks)**
- Determine the mathematical expression for the angle by which  $V_o$  leads  $V_i$ .
  - Determine the phase angle at  $f=100$  Hz, 1 kHz, 2 kHz, 5 kHz, and 10 kHz, and plot the resulting curve for the frequency range of 100 Hz to 10 kHz.
  - Determine the break frequency.
  - Sketch the frequency response of  $\theta$  for the same frequency spectrum of part (2) and compare results.
- B. Using proofs, explain the advantages of the feedback? **(5 marks)**
- C. By using proofs, explain the effect of the feedback on closed loop voltage gain, input impedance and output impedance for transconductance amplifier? **(5 Mark)**

**Question No.3 : (18) Marks**

- A. Fig.4 shows a feedback circuit of the shunt-series type. Find  $I_{out}/I_{in}$ ,  $R_{in}$ , and  $R_{out}$ . Assume the transistor to have  $\beta=100$ . **(6 marks)**
- B. Consider an amplifier having a midband gain  $A_M$  and low-frequency response characterized by a pole  $s=-\omega_L$  and zero  $s=0$ . Let the amplifier

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Answer only the required questions (Extra answers will not be considered)

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be connected in a negative-feedback loop with a feedback factor  $\beta$ . Find an expression for the midband gain and the lower 3-dB frequency of the closed-loop amplifier. By what factor have both changed?

(6 marks)

C. For the series-series feedback in Fig.5. If  $\mu=10^5$ ,  $R_{id}=10k\Omega$   $r_o=100\Omega$ ,  $R_1=100\Omega$ ,  $R_2=10K\Omega$ ,  $R_L=1K\Omega$  and  $r=100 \Omega$ . Find  $R_{if}$ ,  $R_{of}$ ,  $R_{in}$ ,  $R_{out}$ .

(6 marks)

#### Question No.4: (18) Marks

A. A filter has a transfer function  $T(s)=\frac{1}{(s+1)(s^2+s+1)}$ . Show that  $|T|=\sqrt{1+\omega^6}$  and find an expression for its phase response  $\phi(\omega)$ . Then calculate the values of  $|T|$  and  $\phi$  for  $\omega=0.1, 1, 10$  rad. Then find the output corresponding to the following input  $v_i = 2\sin 0.1t$ . (9 marks)

B. An element ladder network has a minimum number of elements to realize a given  $Z(s)$ . two resistor have the value of A ohm and two capacitors A Farads. What are the possible forms of the driving point impedances  $Z(s)$ ? (9 marks)

#### Question No.5: (18) Marks

A. Sketch  $|T|$  for a seventh-order low pass Chebychef filter with  $w_p=1$  rad/second  $A_{max}=1$ dB. Determine the values of  $w$  at which  $|T|=1$  and the values of  $w$  at which  $|T|=\frac{1}{\sqrt{1+\epsilon^2}}$ . Indicate these values on your sketch. Determine  $|T|=1$  at  $w=2$  rad/sec, and indicate this point on your sketch. (6 marks)

B. Design a first order op-amp RC high pass filter having 3-dB frequency of 100Hz, a high frequency gain magnitude of unity, and a high input resistance of  $100K\Omega$ . (6 marks)

C. Synthesis the following driving point function s using first foster, first and second Cauer forms (6 marks)

$$Y(s)=\frac{3s(s^2+2)(s^2+5)(s^2+9)}{(s^2+1)(s^2+4)(s^2+7)}$$

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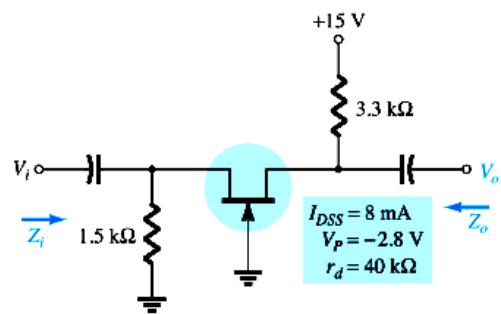


Fig.1

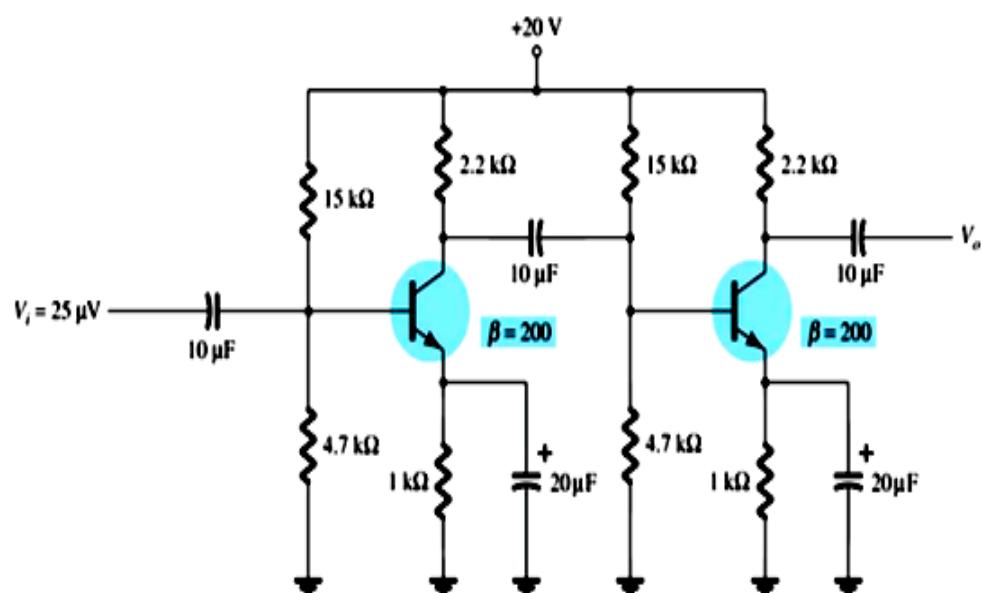


Fig.2

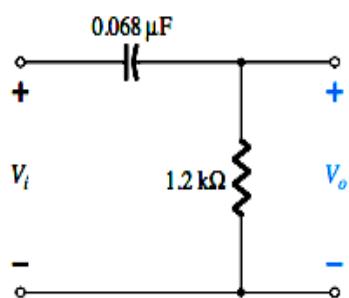


Fig.3

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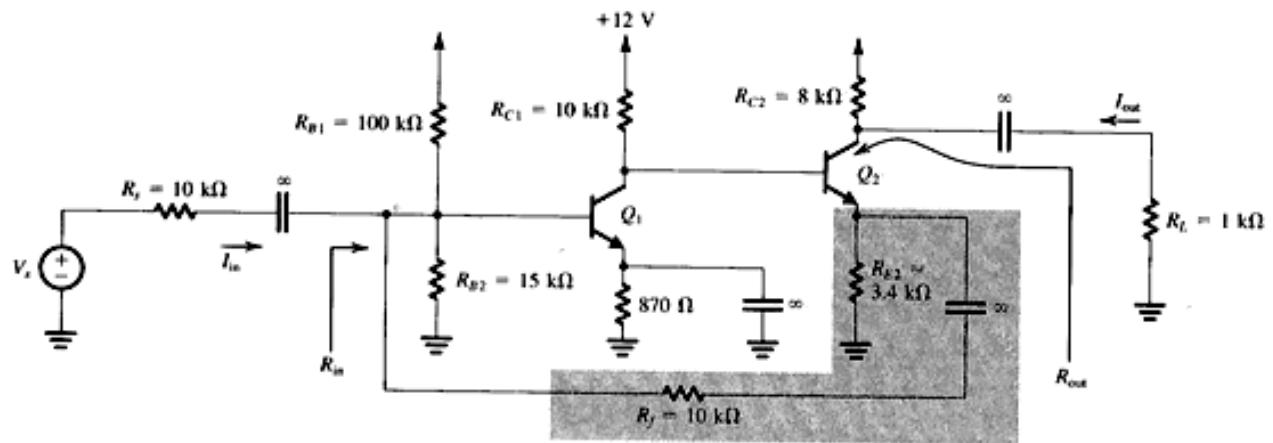


Fig.4

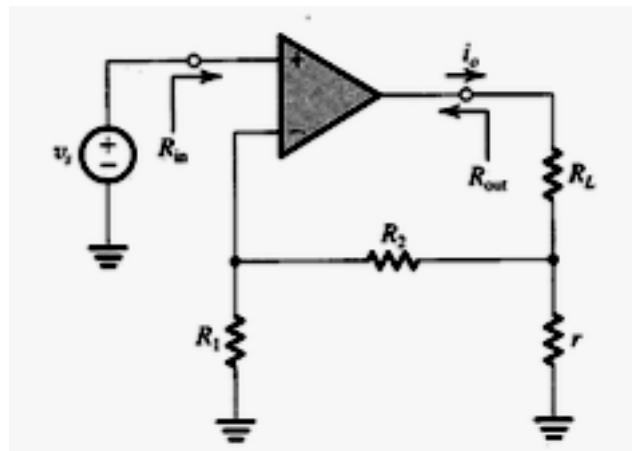


Fig.5

The end of questions  
 Good luck  
 Dr / Hossam Kasem (Coordinator of the Course)

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